

Integrating a Computer-based Flashcard Program into Academic Vocabulary Learning

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Introduction

Second language (L2) learners are generally conscious of the fact that the limitations in their vocabulary knowledge affect their fluency both in spoken and written language, but they are not sure about how to improve their vocabulary. Language teachers also do not know the best way to incorporate vocabulary learning into their teaching (Read, 2004). As a teacher of English, the same situation is also true for me. I very often hear my IEOP (Intensive English and Orientation Program) students complaining about the difficulty of vocabulary learning and asking me a method that may help them learn many words in a short period of time. To be able to help my learners with this problem, this action research was conducted by using the Mills Model which consists of four steps; identify an area of focus, collect data, analyze and interpret data, and develop an action plan. The area of focus in this action research is academic vocabulary teaching with a spaced repetition software called Anki. Based on the Mills Model, I decided to investigate if this flashcard program could help my learners.

Area of Focus Statement

The purpose of this study is to describe the effects of using Anki (i.e. spaced repetition software) in ESL classes on students' academic vocabulary knowledge. In general, learners are unaware of vocabulary-learning strategies that play an important role in their language learning. Although they acquire new vocabulary incidentally while engaged in different language learning activities, a more direct and systematic way of learning is also necessary for the improvement of vocabulary (Read, 2004). With this study, I will try to discover to what extent Anki, which is a spaced repetition tool, impacts students' vocabulary learning and, how it might help them to gain

some vocabulary-learning strategies. The goal will be to see if this approach affects their overall language learning as well as learners' perceptions about the learning process.

Research Questions

- How does the use of Anki (spaced repetition software) affect the academic vocabulary learning of college-level ESL students?
- What are the college-level ESL students' perceptions about learning academic vocabulary with Anki?

Literature Review

Introduction

Vocabulary knowledge has a big effect on second language learners' general language proficiency and it is a prerequisite for mastering a language. Although there are many different methods and techniques available for vocabulary learning in the literature, teachers still have difficulty in choosing an appropriate method according to the needs of their learners (Nation, 2001; Schmitt, 2008). So, the main goal of this literature review is to offer teachers some ideas for effective vocabulary teaching and provide a good rationale for integrating a computer-based flashcard program, Anki, into ESL classrooms.

This review of literature addresses several topics related with second language vocabulary learning. First, the question 'What vocabulary should college-level ESL learners acquire?' is answered and effective ways of presenting target vocabulary are dealt with in the second section. The next two sections focus on some basic principles of explicit vocabulary teaching which include noticing, repetition and retrieval processes and a strategy combining all

these principles which is word card usage. In the final section, the role of computer-based flashcard programs in vocabulary learning area is explored, since this action research project will investigate the effectiveness of the popular flashcard program called 'Anki'.

Target Vocabulary for ESL Students

The first concern in direct vocabulary teaching is to determine which words should be studied. The research in vocabulary learning and teaching shows that there are 2000 words that make up the core vocabulary of English (Nation, 2001; Schmitt, 2000). The list that is used to identify these basic words is West's (1953) classic General Service List (Nation, 2001; Read, 2004). So, Nation (2001) states that the first priority of ESL learners should be mastery of this list because these 2000 words have been shown to make up 80 percent of English words used in written or spoken text.

When college-level ESL students master the General Service List (GSL), they need to pay attention to subtechnical words occurring across a wide range of academic texts (Coxhead 2000; Nation & Hwang, 1995; Read, 2004). An important contribution to this approach is Coxhead's (2000) Academic Word List which was derived by a corpus of around 3.5 million words from four disciplines: arts, commerce, law, and science. Coxhead (2000) used this corpus to find out the range of occurrence of particular words and came up with a list of 570 word families. Coxhead's analysis is especially important for academically oriented ESL learners because this list is covering 10 percent of the running words beyond the 76 percent coverage achieved by the General Service List (Read 2004). Nation (2001) notes the importance of learning Academic Word list because:

With a vocabulary of 2000 words, approximately one word in every five will be unknown. With a vocabulary of 2000 words plus the Academic Word List, approximately one word in every ten will be unknown which is an important change. (p. 17)

As it is stated in the literature, the Academic Word List (AWL) is so important that teachers and learners should spend enough time on it and it should be used to set up goals for courses and included in teaching and learning materials (Coxhead, 2000; Nation & Hwang, 1995). The next section will highlight ways that this list has been integrated into language classrooms.

Incidental Vocabulary Acquisition vs. Intentional Vocabulary Learning

The distinction between incidental and intentional learning of vocabulary has been influential in this research area for a long time. The main issue is to what extent learners gain new vocabulary incidentally as a part of their main learning activity than by means of an activity which is designed to enhance vocabulary knowledge.

Second language (L2) research shows that ESL learners may incidentally acquire new vocabulary through reading and this process may play an important role in L2 vocabulary acquisition (Day, Omura, & Hiramatsu, 1991; Dupuy & Krashen, 1993). L2 studies looking into incidental learning have shown that incidental learning is a gradual process in which repeated encounters are needed to learn words (Horst, Cobb, & Meara, 1998; Rott, 1999; Waring & Takaki, 2003).

It has been assumed that in a setting where communicative approach is used for language teaching, learners can gain new vocabulary without any need for pedagogical intervention. However, Read (2004) claims that the research no longer supports this position any more.

Swanborn and de Glopper (2002) showed that the readers' purpose and level of reading ability influenced the incidental learning of new words. In a research study carried out by Vidal (2003), university students in Spain retained a small number of words one month after viewing videotaped lectures in English. The learners retained only the words that were central to comprehending the lecture topic or the ones that the lecturer explicitly elaborated on. From a psycholinguistic perspective, Hulstijn (2001) indicates that "it is the quality and frequency of the information processing activities (i.e., elaboration on aspects of a word's form and meaning, plus rehearsal) that determine retention of new information" (p. 275).

Although research demonstrates that learners can gain new vocabulary from incidental exposure to some extent, intentional vocabulary learning with an explicit focus almost always results in greater and faster vocabulary gains as well as a better chance of retention (Schmitt, 2008). In a number of studies reviewed by Laufer (2005), explicit exercises led to 33-86% of the words being learned. In her own studies, Laufer (2005) reported that students learned 70 percent of the new words that were on posttests immediately after explicit vocabulary exercises.

Although the percentage decreased to 21-41 % on two-week delayed posttests, the results were better than the incidental learning outcomes (Laufer, 2005). Similar to Laufer's (2005) findings, Smith (2004) indicated that target vocabulary that was emphasized in activities on an internet chat program were remembered well both on posttests and one-week delayed tests.

Considering the results of the studies reported here, one might consider that explicit vocabulary teaching would be an important part of a language classroom. However, the research in this area shows that this is not always the case. As a result of a case study into two Asian contexts, Tang and Nesi (2003) report that explicit vocabulary teaching is not so common in language classrooms. Besides, research shows that teachers do not use many new words in their

lessons which could provide learners with repeated exposure to high-frequency words (Meara, Lightbown & Halter, 1997).

Based on these findings, explicit vocabulary teaching is not enough in language classrooms. However, research indicates that language programs should have an explicit vocabulary teaching component which consists of direct vocabulary teaching activities and incidental vocabulary acquisition should be a complementary activity to intentional vocabulary learning (Baicheng, 2009; Nation 2001; Schmitt, 2008).

The following section will explore the necessary steps for vocabulary learning, starting with the role of ‘noticing’.

The Role of Noticing in Vocabulary Learning

Noticing means giving attention to a new word. To acquire new words, learners should be aware of them and understand that they are useful for their language learning (Ellis, 1991; Nation, 2001; Schmidt, 1990). On the other hand, Krashen (1989) strongly contradicts this argument with Input Hypothesis: “Language is subconsciously acquired-while you are acquiring, you do not know you are acquiring; your conscious focus is on the form, not form” (p. 440). Many language researchers do not think that Input Hypothesis is appropriately applied for second language vocabulary acquisition (Laufer & Hulstijn, 2001; Pigada & Schmitt, 2006). Schmitt (2000) states that passive language learners who wait patiently for involuntary actions to trigger noticing will be unsuccessful learners because learning will happen very slowly.

People in the language learning area generally try to facilitate learners’ noticing by using different techniques such as textual enhancements (Coxhead, 2008). Noticing can happen while learners are reading a text, during a discussion or in situations where learners understand that the

new word is filling a gap in their knowledge (Ellis, 1990). Besides, learners can notice new vocabulary while looking up a definition in a dictionary or deliberately studying a word (Nation, 2001).

However, the noticing of unfamiliar words is not enough alone to help learners acquire new vocabulary effectively. The research presents many different factors affecting vocabulary learning. Repetition is another important aspect associated with vocabulary learning.

The Role of Repetition for Vocabulary Learning

Repetition is an indispensable part of vocabulary learning because there is so much to learn about each word. Working once with a new word will not be enough to gain necessary information and mastery. Repetition not only adds to the quality of knowledge but also to the quantity of this knowledge (Nation, 2001). Studies in the psycholinguistic area have also supported the role of repetition in learning vocabulary. De Groot (2006) indicated that Dutch students learned from 43% to 70% of the target words on a one-week delayed test after six 10-second exposures to translation pairs and three receptive tests. Although the duration of those meetings with target words was short, it was obvious that repetition helped learners acquire most of the new words.

However, the number of repetitions that learners need to learn a new word remains controversial. First of all, learners can acquire certain kinds of new words more easily than others such as concrete nouns which require fewer repetitions compared with other abstract nouns. In addition, certain knowledge of a new word is more easily learnable than other aspects of the same words. For example, form of a new word can be more responsive to repetition, but

learners need to see target words in context to be able to learn the meaning of them (Coxhead, 2008; Horst et al., 1998).

The biggest reason why researchers cannot agree upon an exact number of repetitions learners need to acquire new vocabulary is related with learner-dependent factors. The number of repetitions needed to learn new vocabulary will be different for learners based on their language background and the knowledge base from which they approach the target vocabulary. If a target word is familiar to the learner to some extent, the learning burden will be quite light. However, if it is too unfamiliar, the learner will spend more time trying to learn the new word. In addition to familiarity, the variation in motivation and language-learning aptitude can also affect the number of repetitions needed for different learners (Nation, 2001).

Considering all the variables discussed, one can understand why the research literature dealing with the issue of how often learners need to encounter new words differs so widely, from 6-20 repetitions (Webb, 2007a). In his brief overview of the related studies, Nation (2001) found that a range of from five to more than 20 repeated meetings were necessary for learners to acquire new words according to different criteria.

Webb (2007a) indicated that at least ten repetitions of target words can produce sizable gains in vocabulary knowledge, although more than ten repetitions may be needed to develop full knowledge of a word (Horst et al., 1998). Horst et al. (1998) found that initial repetitions led to learners' acquisition of a word's spelling, grammatical function and syntagmatic associates and productive knowledge of its paradigmatic associates. Further repetitions were needed for learners to understand the meaning of the target word. Even after learners grasped the meaning of the target word, repetition led to improvement of learners' receptive and productive

knowledge of syntagmatic and paradigmatic associates. Webb`s (2007a) findings support Nation`s (1999) claim that there is no set number of repetitions that will ensure learning.

Although researchers do not agree on an exact number of repetitions for vocabulary learning, they all emphasize the role of the recycling process. Nation (1990) noted that “disregarding the exact number of repetitions required, the important point is that recycling is necessary and if it is neglected, many partially learned words will be forgotten, wasting all the effort already put into learning them” (p. 45).

Schmitt (2008) also claims that recycling should be carefully integrated into vocabulary learning programs. He criticizes language teachers showing new lexical items once and then forgetting them because he thinks that most of the learners will likely do the same thing. Thus, his suggestion for teachers and material writers is to think about vocabulary learning in longitudinal terms and recycle new words in an organized way. Spaced repetition is one of the ways suggested for organizing vocabulary learning.

Spaced Repetition

Based on memory research and second language vocabulary learning research, Nation (2001) cites several researchers whose results have shown that spaced repetition is much more effective than massed repetition. Massed repetition requires learners to spend a continuous period of time paying attention to a target word. On the other hand, spaced repetition means spreading the repetition sessions across a long period of time. For example, the target vocabulary might be reviewed for three minutes now, another three minutes a few hours later, three minutes a day later, three minutes two days later and finally three minutes a week later instead of reviewing a new word for fifteen minutes a day as in the massed repetition. The total time

reviewed is fifteen minutes again, but that time is spread across ten days which ensures a more permanent learning. Nation (2001) explains the general principle behind spaced repetition with these words:

After a piece of learning, the forgetting is initially very fast and then slows down.

On the second repetition, a piece of learning is older than it was on the first repetition and so the forgetting on the second repetition will be slower than it was.

On the third repetition the forgetting will be even slower. The right probability of recall level is one where the learner has forgotten enough to feel that repetition is worthwhile attending to and yet not forgotten too much so that there is still a good chance of recalling and thereby strengthening the form-meaning connection. (p.

75)

On the other hand, memory research supports the effectiveness of spaced repetition with physical changes in the brain. Baddeley (1990) stated that spacing repetitions allows time for the regeneration of neuro-chemical substances that make changes in the brain. Massed repetition does not allow enough time for these substances to regenerate and thus they cannot continue to make the physical changes needed for learning.

There are various memory schedules applying this basic principle of ‘spaced repetition’ in the literature. However, the memory schedule that Pimsleur (1967) proposes as a guide for the size of the spaces between the repetitions is the one most commonly cited one in the literature (Nation, 2001; Schmitt, 2000). His schedule uses an exponential scale, so if the first interval between interactions with a new word is five seconds, then the next intervals should be $5^2 = 25$ seconds, then $5^3 = 125$ seconds (about 2 minutes), the next $5^4 = 625$ seconds (about 10 minutes)

and so on. Although Pimsleur's schedule is well-known in the literature, Nation (2001) considers his schedule as a rough guide and says that "there is no particular reason why the spacing between the repetitions should be a matter of precise measurement" (p. 77).

In addition to the spacing of repetitions, the nature of repetition is another important factor that affects the learning process of target words. The next section will highlight the role of retrieval process in vocabulary learning.

The Role of Retrieval Process in Vocabulary Learning

According to experimental studies in the area, simultaneous presentation of a word form and its meaning is best for the first encounter, but delayed presentation is more effective later on because there will be a chance for learners to make an effort to recall the new words which will presumably lead to better learning of them (Nation, 2001). In one study, both each foreign word and its English translation were encountered by the learners on the first trial and then, learners were expected to guess the target words to recall them on following trials (Baddeley, 1990). The study showed that the recalling procedure helped learners to acquire more new words. Instead of simply encountering words again and again, retrieving increases the chances that target words will be remembered better later on because it will require much greater effort similar to performance during normal use.

Teachers should make learners more aware of the importance of retrieving for their vocabulary learning and encourage them to integrate this repetition technique into their learning activities (Nation, 2001). Retrieval plays an important role in the strategy of using word cards for vocabulary learning and it makes the word cards more favorable for learners compared to other strategies such as notebooks or lists of vocabulary items (Schmitt & Schmitt, 1995; Waring,

2004). Because the target words and their meanings are put on different sides of word cards, retrievals with them will be easier for learners compared with word lists where L2 words and their meanings are presented at the same time. The strategy of using word cards for vocabulary learning will be examined in the following section.

Learning from Word Cards as a Vocabulary Learning Strategy

The term ‘learning from word cards’ is defined as “the formation of associations between a foreign language word form (written or spoken) and its meaning (often in the form of a first language translation, although it could be a second language definition or a picture or a real object)” (Nation, 2001, p. 296). In the process of learning from word cards, a learner writes a new word on one side of a card and its first language translation on the other side. Then, the learner goes through these cards trying to retrieve the meanings of new words.

Word card strategy, one type of a paired-associate learning, has typically been ignored in the area of vocabulary learning and teaching because it is considered an example of the behaviorist learning model (Hulstijn, 2001). Several studies show that flashcard learning is an important learning activity in terms of helping learners memorize large number of words in a short time (Fitzpatrick, Al-Qarni, & Meara, 2008; Nation, 2001). Some recent studies also demonstrated that learners can transfer flashcard learning to normal language use (Elgort, 2007; Webb, 2002, 2009a). However, Nation (2001) indicated that the extent to learning with flashcards depends upon the way that the word cards are used and suggested some effective strategies for learning with word cards.

As mentioned earlier, the retrieval process is an indispensable part of flashcard learning. So, learners using flashcards should be encouraged to retrieve the meaning of the target word

from memory which leads to a more permanent learning (Barcroft, 2007; McNamara & Healy, 1995; Nation, 2001). In addition to the retrieval process, the order of the flashcards is another factor which affects the learning process. According to Baddeley's (1990) primacy and recency effects, the items at the beginning and the end of a list are memorized better than the words in the middle. Taking into account this finding and also the fact that learners have the freedom to change the order of words if they study with flashcards, learners should put difficult words near the beginning, so these words can get more attention. Nation (2001) also suggests that learners to put target vocabulary in a phrase or sentence. Studies looking into the effect of a single sentence on vocabulary learning show that the use of an example sentence in vocabulary learning supports both the learning process and retention in the long run (Baicheng, 2009; Cobb, 1997; Laufer & Shmueli, 1997). Based on the elaboration process, Baicheng (2009) states that sample sentences cause learners to increase their information processing load as they reflect on the syntactic feature of target vocabulary given in an example sentence. This load facilitates the retrieval process later on because learners can find various paths to access new items in their memory.

It is possible to find many different strategies for using flashcards effectively in the literature. However, Mondria and Mondria-de Vries (1994) propose a practical way of using flashcards with spaced repetition which is a 'hand computer' divided into five sections. To be able to use this 'hand computer', words to be learned are written on cards and put into section 1. When a word is known by the learner, it goes into section 2. When section 2 fills up, the words are reviewed again and those that are known are put into section 3 and those not remembered go back to section 1. The same process occurs for section 4 and 5 with words not learned going back to section 1.

It is true that using word cards give learners a chance to implement expanded rehearsal more easily compared with other strategies like word lists. However, learners should be knowledgeable about different strategies to use word cards effectively such as planning review schedule and monitoring their learning. If they do not have those skills, word card learning can even cause inefficient learning (Nakata, 2011). On the other hand, a computer program can easily help learners with areas such as planning and monitoring regardless of their abilities (Hulstijn, 2001; Nation, 2001). The following section will explore the possibility of using computer-based flashcard programs for vocabulary learning.

Computer-based Flashcard Programs

There are numerous numbers of flashcard programs available for vocabulary learning in a second language and some of them are widely used around the world. While Nakata (2011) states that 50 universities and hundreds of schools all over the world use *vTrain* (a flashcard program), more than one million people have access to *Quizlet*. It is also reported that Nintendo DS, a flashcard program for English learning, is integrated into English curriculum in all the public junior high schools in Kyoto, Japan (Tamaki, 2007).

Based on the methods and strategies used for word card learning discussed in the previous section, the features of an ideal flashcard program include presentation and retrieval modes, scheduling ability, flexibility about block size and ability to help learners increase retrieval effort (Barcroft, 2004; Nation, 2001; Pyc & Rawson, 2007). Many researchers support the widespread use of flashcard programs and claim that they are more effective than paper-based ones because of the following reasons. The first benefit of a computer-based flashcard program is that it can record a learner's improvement over a period of time and it can arrange the

order of words that can help learners study difficult words more often than easy items (Nakata, 2008; Pyc & Rawson, 2007). Also, computer-based flashcard programs can offer numerous ways for the presentation of new words by means of their multimedia capabilities which can in turn increase learners' motivation and autonomy (Allum, 2004; Hulstijn, 2001; Nakata, 2006; Nation, 2001). With computer programming, retrieval can be practiced more easily by second language learners (Allum, 2004).

The idea behind many current electronic flashcard programs such as *SuperMemo*, *Anki*, *StudyProf*, *Teachmaster* is based on the Leitner system (Godwin-Jones, 2010). In 1940, Sebastian Leitner created a 5-step process by using index cards in a box. This box is divided into five sections and flashcards are moved from the first section to next one on a daily basis if learner can remember them well. If cards are not remembered, they stay in the same section. Each following section has a longer time lag and if words are remembered in the final section after a longer interval, they do not need to stay in the system anymore. At this point, it is assumed that the words are stored in the learner's long term memory. Today, the electronic systems use a scale system instead of a box, but the action is still designed according to the user's actions. The user chooses an option from a scale of 0 to 5 according to how well s/he remembers the word. Then, the system arranges a schedule to review this item again based on the score (Nakata, 2008).

There are so many electronic flashcard programs designed following the rules of this system. Although *SuperMemo* is one of the most well-known flashcard programs, it is criticized in the literature because of the difficulty to customize it. A program becoming more popular is *Anki* (Godwin-Jones, 2010).

With Anki, word cards can be designed in a variety of ways and different options such as pictures, graphics, and pronunciation of words can be added to them. Different from other flashcard programs, Anki is much more flexible and it provides users with the opportunity to change the directions of the word cards easily and create various kinds of cards. Instead of creating their own cards, users can also import ready-made card decks into their Anki program and start reviewing the cards right away. It is also possible for users to share their own card set with other users. Another good feature of anki is that learners can access their card decks with free online website by using desktop syncing or using it with their mobile phones (Godwin-Jones, 2010).

Summary

Vocabulary knowledge forms the basis of second language learners' general language proficiency. When learners master the General Service List which includes the most common 2,000 words in English, academically oriented ESL learners need to work on the Academic Word List as well. Although these facts are well-known by teachers, learners, researchers and material developers, it is unclear the best way to achieve success with these word lists (Schmitt, 2008). Studies on both incidental and intentional learning of vocabulary still continue.

The research shows that incidental learning can help language learners to some extent (Day, Omura, & Hiramatsu, 1991; Dupuy & Krashen, 1993), but if it is not supported with other direct teaching materials, it will not be helpful enough to help learners master necessary vocabulary. Current studies suggest that teachers should pay attention to explicit vocabulary teaching which can encourage learners to acquire a lot of new words in a short time (Tang & Nesi, 2003).

Language teachers should be aware of different components of intentional vocabulary learning process for effectively integrating of explicit vocabulary teaching into classrooms. As a first step, teachers should help learners notice the target vocabulary and understand the importance. Then, repetitions of target words should be organized carefully. Instead of massed repetition and word lists, learners should be encouraged to use spaced repetition and word cards, so they can go through retrieval process which guarantees a better learning (Nation, 2001).

However, if learners are not aware of effective strategies to implement spaced repetition with word cards, they may not be successful. The solution to this problem can be using a computer-based flashcard program. Flashcard programs can offer many advantages for learners that paper-based programs cannot (Nakata, 2008; Pyc & Rawson, 2007). Considering the empirical studies that states the effectiveness and efficiency of using flashcards for vocabulary learning (Fitzpatrick, Al-Qarni, & Meara, 2008; Nation, 2001), it seems worthwhile to investigate using computer-based programs for this purpose. The following chapter will explain the methodology used for this study and how Anki, a spaced repetition, can be integrated into language classrooms to help learners with their academic vocabulary learning.

Intervention or Innovation

The research both in memory and second language learning area shows that spaced repetition is more effective than massed repetition and it ensures more permanent learning (Nation, 2001). According to the spaced repetition learning system, most of the forgetting will happen immediately after the first encounter of a new word. The next time, the target word can be remembered for a day or two. However, the time after that, the learner will probably remember it for a longer time.

Thus, as an intervention, a spaced repetition program, Anki, was used in two IEOP (Intensive English and Orientation Program) classes to help academically oriented college-level ESL learners improve their academic vocabulary. An Anki dictionary which includes only academic words appropriate for the level of students was created for this study. After downloading the dictionary, students started reviewing new words. They were told to review at least 10 new words each day for ten minutes at the beginning of each class. Intervention process continued for three weeks. Both classes started with 10-minute reviewing session for three weeks.

Membership of the Action Research Group

Participants in this study included 13 intermediate-level students in my ESL reading and writing classes in the Intensive English and Orientation Program (IEOP) at Iowa State University who were studying English to pass TOEFL (Test of English as a Foreign Language) or IELTS (International English Language Testing System) to begin their academic classes at different universities in the United States. Participants were homogenous in terms of their native languages, since most of them were from China and were native speakers of Mandarin Chinese (with one Arabic-speaking learner).

Negotiations to be Undertaken

First of all, I contacted IEOP administration to see if it was possible to conduct a research in my classes. I filled out necessary forms and got the permission from Barbara Schwarte who was the director of IEOP. As a second step, I applied for IRB because I wanted to publish the results. The application was approved by institutional review board and the study was declared exempt from the requirements of the human subject protections regulations (see Appendix A).

Timeline

January 24 th	Identify an area of focus
February 7 th	Review related literature
February 21 st	Plan intervention and data collection
February 28 th	Design Anki dictionary
March 21 st	Conduct pretest and start intervention
April 8 th	Implement posttest and postproject survey
April 8 th -13 th	Conduct interviews
April 14 th -25 th	Data Analysis and Complete project
April 30 th	Present project to class

Data Collection

The participants practiced academic vocabulary with Anki every day for 3 weeks. Both the reading class and the writing class meet for 50 minutes every day. At the beginning of each class, learners reviewed 10 words during the first ten minutes of each class. They were also expected to continue reviews on the weekends.

On the first day of the intervention, the pre-project questionnaire and vocabulary test were administrated. Then, the importance of academic vocabulary learning was discussed in both classes by the teacher who was also the researcher. Coxhead's (2000) academic vocabulary list was introduced to them and explained how the list was created to help academically oriented ESL learners. Also, the teacher briefly introduced learners to 'Anki' as a tool that could help them learn academic words that Coxhead's (2000) list includes, and announced that they were

using Anki in the class during the semester. It was explained that Anki could be used on a laptop as well as on other mobile devices such as cellphones, iPods or iPads. Because each class has only one lab day, students were asked to bring either their laptops or any of those mobile devices to class every day.

In the following class, a detailed presentation was given to students about how to use the tool and different features of it. Then, students downloaded 'Anki' to their own devices and imported the academic words dictionary to their Anki programs. Except for one student who decided to use his iPad, all students in the reading class decided to use their laptops. On the other hand, the situation in the writing class was different. While three students were using their laptops, the other four was using their cellphones. After downloading the dictionary, they were ready for the reviewing process. The students were told to review at least 10 new words each day for ten minutes at the beginning of each class. They got used to that idea very soon and then the reviewing process continued for another two weeks. Each reading and writing class started with 10-minute reviewing session for three weeks. During those three weeks, the researcher took notes of her observations as well as the reflections on them.

After a three-week learning process, the academic vocabulary part of the vocabulary levels test designed by Schmitt, Schmitt & Clapham (2001) was given to learners again to be able to evaluate the effect of intervention on students' academic vocabulary knowledge. In addition, the participants completed the Likert-scale survey about the usefulness and usability of the tool and, the enjoyment of the process. During the week following the intervention, 15-minute interviews were conducted with students and they shared their experiences of learning academic vocabulary with Anki. The data from the survey and interviews were triangulated with

the data from observations to check the accuracy of instruments and to prepare more accurate and reliable answers for research questions.

Analysis of the Data

To answer the first research question, the study made use of the quantitative data from the vocabulary level test that was given before the study and at the end of the study. A paired samples t-test was conducted using the SPSS computer analysis program to examine the differences in means that may be present between pre-test and post-test scores.

To address the second research question about learners' perceptions, data were compiled from the post-project survey, interviews and observations. Survey results were entered into SPSS program and descriptive statistics were used for the analysis of each Likert-scale item. Mean scores and standard deviation of each survey item were used to answer the research question investigating the learners' perceptions.

The data obtained from interviews and observations were analyzed by means of a coding scheme, namely the data providing similar types of information were grouped together (Parson & Brown, 2002). Hence, I searched for utterances that revealed learners' perceptions about the learning process with Anki as I read through the interview transcripts and observation notes, and highlighted words or phrases related to the perception of usefulness, usability and enjoyment with different colors as it was suggested by Schwalbach (2003) who indicates that it is important for researchers to find some mechanism for coding that works for them. After coloring the narrative data according to these three themes, the data with the same color were grouped together under the subheadings of usefulness, usability and enjoyment, and used as a supportive evidence for survey results.

Findings

This section presents the findings of the data analysis to address the two research questions. In particular, this chapter deals with the issue of the extent to which Anki academic dictionary used in the study has affected learners' academic vocabulary and, learners' perceptions about academic vocabulary learning process with Anki.

- *How does the use of Anki (spaced repetition software) affect the academic vocabulary learning of college-level ESL students?*

In order to examine if there were significant improvements in the participants' academic vocabulary knowledge after the intervention process, the academic vocabulary part of the vocabulary test developed by Schmitt, Schmitt and Clapham (2001) was administrated both before the training and at the end of the study. Although there were 13 participants in the study, 12 participants' vocabulary test results were analyzed because one of the participants did not take the pre-test. While the mean of the pre-test was 19.3 (SD = 6.8), it increased to 23. 6 on the post-test (SD = 5.3).

Measures of central tendency (means and standard deviations) of these two tests were compared and the paired samples t-test was conducted on data obtained from pretest and posttest results. The table below shows the results obtained. The asterisk * in the last column indicates that the difference between the pre-tests and post-test results was statistically significant at the $p < .05$ level, which highlighted that there was a knowledge gain during the three-week training. The results implied that learning academic vocabulary with Anki facilitated an increase in academic vocabulary knowledge of college-level ESL learners.

Paired Samples Test

pretest - posttest	Mean	Std. Deviation	Std. Error Mean	t	df	Sig. (2-tailed)
	-4.3	3.7	1.0	-3.9	11	.002*

This finding corresponds with the claims of Laufer (2005) and Schmitt (2008) who indicate that explicit vocabulary learning helps learners to gain greater amount of vocabulary in a short period of time in addition to a better chance of retention. Learners practiced about two hundred academic words in three weeks and their scores increased significantly. Although the intervention process affected each learner's success at different rates, all learners scored at least 15 out of 30 which means that they become proficient in almost half of the *Academic Word List*.

- *What are the college-level ESL students' perceptions about learning academic vocabulary with Anki?*

Learners' perceptions about use of the flashcard program for vocabulary learning were categorized under three subheadings: *usefulness, usability, and enjoyment*. To answer this question, the data obtained from the survey about learners' perceptions, interviews and observations were analyzed.

Regarding the learners' perceptions about the usefulness and usability of the program, the results suggested that learners found learning academic vocabulary with Anki useful and they found the program useable. The observational data also supported these findings indicating that most of the learners understood the purpose of Anki easily and felt very comfortable using the Anki dictionary. After I showed learners how to download the program to their laptops or use it on their cellphone, most of the learners easily downloaded it and set it up. Because I wanted to

make all learners use the same dictionary, the dictionary prepared for this study was exported and sent it to participants as an e-mail attachment. Learners had a little difficulty only during the process of importing this dictionary to their own Anki programs because it required them to follow many steps. However, a special help was given to each learner by the researcher and they were able to open the academic dictionary file on their programs. During the rest of the study, they started and used the program very easily.

By using Anki, learners did not spend time arranging review schedules. Anki organized the reviewing process and presented the words in a planned manner according to the review options chosen by each learner. During interviews, one of the students commented, “Oh, yeah...it (Anki) was useful. Maybe, for the first three or four times I was not clear about words and their meanings. Later on, I found that I learned many words and are familiar with many words. As soon as I saw the definition, I was able to find the word” (S1).

In addition, learners also found different components of the Anki dictionary useful, such as example sentences. One learner mentioned, “Example sentence is very important. It helped me to learn the how to use the word. Also, if it is a noun or a verb” (S7). The findings showing that example sentences facilitated the learning process coincides with other researchers’ findings indicating that example sentence in vocabulary learning supports both the learning process and retention in the long run (Baicheng, 2009; Laufer & Shmueli, 1997; Cobb, 1997).

Although learners reported that example sentences and definitions were useable in general, interview data shed light on some possible problems regarding the usability of definitions. Some of the learners complained that the definitions were long and the unknown words made the understanding difficult for them. One learner commented, “I didn’t understand

the meanings. Meanings were unclear. Example sentences were OK. Most of them were clear” (S2). The observational data also supported this finding too. Some of the learners were always checking their bilingual dictionaries during review sessions which decreased the number of words seen by them every class.

In general, learners agreed that Anki was easy to use and they did not report that they had any serious technical problems. However, observations and interview data showed that a few learners had to wait for a long time to start Anki which made them review fewer words than other. One learner commented, “Every time I turn on my laptop, I clicked Anki and I had to wait for a long time. It was really slow” (S6).

Regarding learners’ perceptions of enjoyment, survey results indicated that they enjoyed learning academic vocabulary with Anki. My observations also coincide with this finding. Trying a new way of learning words caught learners’ attention from the first day. Most of them got used to the idea of reviewing vocabulary with Anki very soon and they were very careful about bringing their laptops or cellphone to classes. In the interviews, several participants expressed how they felt about using Anki for their vocabulary learning. Some of them indicated that they liked it because it was a new way of learning and they used it for a limited time every time. Although they stated that the Anki is not interesting or motivating during the interviews, they enjoyed trying a different way of learning new words and seeing that they were really improving their vocabulary.

Sometimes, I felt bored, but it is OK. Learning is boring, so that’s fine. Sometimes, I found it enjoyable. When I saw that I was learning, I found it very enjoyable. (S3)

Learning vocabulary is not interesting. Process is boring, but when you see that you have learned something, then it is very interesting. (S7)

However, the lowest mean scores of two survey questions indicated that learners were not sure if Anki was interesting or motivating for vocabulary learning. They stated that it would have been better if the dictionary were enriched with more information such as pronunciations of new words, the meanings of words in learners' native language or pictures.

I think there are many things that can help to improve Anki. Sometimes, you know I ask you the pronunciations of words. That should be on that. If you add pronunciation, it can be more interesting. If I don't know the pronunciation, I cannot spell the word. Also, definitions can be clearer and more meanings can be added. (S2)

I think you can show some pictures to explain definition. You know, some people remember the words by imagining them and also you can also add some pronunciation about the word. So, some people can read it and speak it. Just know the definition, they cannot speak. (S6)

Even though technology integration into vocabulary learning helped them to enjoy learning, survey results showed that they were not so sure about whether learning vocabulary with Anki is interesting or motivating. This may result from the limitations of the Anki academic dictionary that I created according to the needs of this specific group of learners. The research suggests that computer-based flashcard programs can increase learners' motivation to a great extent by presenting various multimedia possibilities (Nakata, 2006; Allum, 2004; Hulstijn, 2001; Nation, 2001). However, this study focused on the spaced repetition aspect of the flashcard program and the flashcards used in this study did not integrate multimedia capabilities. The participants also indicated this deficiency stating that program could be more interesting for them if the pronunciations of words were provided in addition to the definitions of the words and example sentences.

Action Planning

This action research found out that flashcard programs are promising for vocabulary learning in terms of giving ESL learners a chance to organize their vocabulary learning based on the spaced repetition, an effective way of remembering things (Baddeley, 1999; Nation, 2001). The spaced repetition tool, Anki, used for this study helped academically oriented college-level ESL students improve their academic vocabulary, and learners found Anki useful, usable and enjoyable. As a result, I will be aware of the potential of this program for vocabulary learning and try to make necessary adjustments for my future students based on this research.

First, since the number of students participated in this study was limited; it is difficult to generalize the findings. So, the usability and effectiveness of this flashcard program need to be checked with a broader group of participants. To be able to do this, I can collaborate with other teachers in IEOP.

Second, as the findings of this study suggested that the integration of different multimedia options into the Anki dictionary could make Anki more interesting and motivating, I am planning to create a new Anki dictionary based on the recommendations of the learners such as pronunciations of the new words, and I want to test it with my future ESL classes.

Third, I am planning to evaluate the effect of learning vocabulary with Anki on learners' language proficiency in different language skills such as speaking or reading. For example, the pronunciation of words can be recorded and incorporated into the dictionary by using the audio feature of Anki and its effect on learners' speaking ability can be assessed with various speaking activities.

In addition, I want to investigate the effectiveness of the flashcard program in a class in which learners design their own Anki dictionaries and then review their own dictionaries instead of the one created by me. In the interviews, I saw that learners had great ideas about how to use Anki creatively. If I give learners a chance to create their dictionaries, they can explore the tool better and take the responsibility for their learning which may help them to get ready for their future academic studies.

All in all, this project helped me to understand that Anki could be a good solution for vocabulary learning problems of my ESL students. From now on, I plan to integrate this spaced repetition tool into my ESL classes to provide my learners with a possibility to arrange their vocabulary learning for a more permanent learning.

Appendix A. Research Approval Form From IRB

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Institutional Review Board
Office for Responsible Research
Vice President for Research
1138 Pearson Hall
Ames, Iowa 50011-2207
515 294-4566
FAX 515 294-4267

Date: 4/6/2011

To: Cennet Altiner
831-24th Street, #45
Ames, Iowa 50010

CC: Dr. Ann Thompson
N108 Lagomarcino

From: Office for Responsible Research

Title: Expanding Academic Vocabulary with a Spaced Repetition Software

IRB Num: 11-101

Submission Type: New

Exemption Date: 4/6/2011

The project referenced above has undergone review by the Institutional Review Board (IRB) and has been declared exempt from the requirements of the human subject protections regulations as described in 45 CFR 46.101(b). The IRB determination of exemption means that:

- **You do not need to submit an application for annual continuing review.**
- **You must carry out the research as proposed in the IRB application**, including obtaining and documenting informed consent if you have stated in your application that you will do so or if required by the IRB.
- **Any modification of this research should be submitted to the IRB on a Continuing Review and/or Modification form, prior to making any changes**, to determine if the project still meets the federal criteria for exemption. If it is determined that exemption is no longer warranted, then an IRB proposal will need to be submitted and approved before proceeding with data collection.

Please be sure to **use only the approved study materials** in your research, including the **recruitment materials** and **informed consent documents** that have the IRB approval stamp.

Please note that you must submit all research involving human participants for review by the IRB. **Only the IRB may make the determination of exemption**, even if you conduct a study in the future that is exactly like this study.

Appendix B. Schmitt, Schmitt, and Clapham's (2001) Vocabulary Levels Test, Version 2

Levels Test 5

Version 2 Academic Vocabulary

1 area
2 contract _____ written agreement
3 definition _____ way of doing something
4 evidence _____ reason for believing
5 method _____ something is or is not true
6 role

1 debate
2 exposure _____ plan
3 integration _____ choice
4 option _____ joining something into a
5 scheme _____ whole
6 stability

1 access
2 gender _____ male or female
3 implementation _____ study of the mind
4 license _____ entrance or way in
5 orientation
6 psychology

1 accumulation
2 edition _____ collecting things over time
3 guarantee _____ promise to repair a broken
4 media _____ product
5 motivation _____ feeling a strong reason or
6 phenomenon _____ need to do something

1 adult
2 exploitation _____ end
3 infrastructure _____ machine used to move
4 schedule _____ people or goods
5 termination _____ list of things to do at
6 vehicle _____ certain times

1 alter
2 coincide _____ change
3 deny _____ say something is not true
4 devote _____ describe clearly and exactly
5 release
6 specify

1 correspond
2 diminish _____ keep
3 emerge _____ match or be in agreement
4 highlight _____ with
5 invoke _____ give special attention
6 retain _____ to something

1 bond
2 channel _____ make smaller
3 estimate _____ guess the number or size
4 identify _____ of something
5 mediate _____ recognizing and naming
6 minimize _____ a person or thing

1 explicit
2 final _____ last
3 negative _____ stiff
4 professional _____ meaning 'no' or 'not'
5 rigid
6 sole

1 abstract
2 adjacent _____ next to
3 controversial _____ added to
4 global _____ concerning the whole world
5 neutral
6 supplementary

Appendix C. Postproject Survey

Participant Name: _____

For the items 1-20, please circle the number that most closely matches your response to each statement.

	Strongly Disagree	Disagree	Not sure	Agree	Strongly Agree
1. Using Anki for vocabulary learning is enjoyable.	1	2	3	4	5
2. It was easy to use Anki.	1	2	3	4	5
3. I understood the purpose of Anki clearly.	1	2	3	4	5
4. The explanations of words were clear enough for me to understand new words.	1	2	3	4	5
5. Example sentences were useful for me to remember new words.	1	2	3	4	5
6. I used 'again', 'hard', 'good' and 'easy' options of Anki to arrange my vocabulary study.	1	2	3	4	5
7. I have not experienced any technical difficulty with Anki.	1	2	3	4	5
8. I learned many new words by looking at the explanations of words.	1	2	3	4	5
9. I learned many new words by using example sentences.	1	2	3	4	5
10. Learning vocabulary with Anki is interesting.	1	2	3	4	5
11. It is motivating to use Anki to learn new words.	1	2	3	4	5
12. I liked seeing example sentence and definition first.	1	2	3	4	5
13. I liked the fill-in-the-blanks exercises for vocabulary learning.	1	2	3	4	5
14. I have already known how to arrange my vocabulary study.	1	2	3	4	5
15. I think Anki can help me improve my vocabulary.	1	2	3	4	5
16. I think using Anki on the internet is helpful.	1	2	3	4	5
17. Anki can help language students learn new words easily.	1	2	3	4	5
18. My academic vocabulary has improved since I started using Anki.	1	2	3	4	5
19. I would use Anki again in the future after this class is over.	1	2	3	4	5
20. This kind of tools should be included in language courses.	1	2	3	4	5

Appendix D. Interview Questions

The following questions will be asked during the interview:

- Do you think Anki helped you increase your academic vocabulary?
- Did you find Anki useful for your vocabulary learning?
- Which aspects of it did you find most useful? Which aspects did you find least useful?
- What did you enjoy the most about using Anki for academic vocabulary learning?
- What did you enjoy the least?
- How did you find the organization of the dictionary used in the classroom? Are example sentences and explanations are clear enough?
- How do you think Anki could be used differently so that it can help you learn words better?
- If you create your own dictionary by using Anki, how would you design the cards different from the cards used in the classroom? What kind of information do you want to add more?

REFERENCES

- Allum, P. (2004). Evaluation of CALL: Initial vocabulary learning. *ReCALL*, 16(2), 488-501.
- Baddeley, A. (1990). *Human Memory*, London: Lawrence Erlbaum Associates.
- Baicheng, Z. (2009). Do example sentences work in direct vocabulary learning? *Issues in Educational Research*, 19(2), 175-189.
- Barcroft, J. (2004). Effects of sentence writing in second language lexical acquisition. *Second Language Research*, 20(4), 303-334.
- Barcroft, J. (2007). Effects if opportunities for word retrieval during second language vocabulary learning. *Language Learning*, 57(1), 35-56.
- Cobb, T. (1997). Is there any measurable learning from hands-on concordancing? *System*, 25, 301-315.
- Coxhead, A. (2000). A new academic word list. *TESOL Quarterly* 34(2), 213-238.
- Coxhead, A. (2008). Phraseology and English for academic purposes. In F. Meunier & S. Day, R.R., Omura, C., & Hiramatsu, M. (1991). Incidental EFL vocabulary learning and reading. *Reading in a Foreign Language*, 7, 541-551.
- Day, R. R., Omura, C. and Hiramatsu, M. (1991) Incidental EFL vocabulary learning and reading, *Reading in a Foreign Language*, 7, 541-551.
- de Groot, A. M. B. (2006). Effects of stimulus characteristics and background music on foreign language vocabulary learning and forgetting. *Language Learning*, 56(3), 463-506.
- Dupuy, B. & Krashen, S. D. (1993). Incidental vocabulary acquisition in French as a foreign language, *Applied Language Learning*, 4 (1+2), 55-63.

- Elgort, I. (2007). *The role of intentional decontextualized learning in second language vocabulary acquisition: Evidence from primed lexical decision tasks with advanced bilinguals* (Unpublished doctoral dissertation). Victoria University of Wellington, Wellington, New Zealand.
- Ellis, R. (1990). *Instructed Second Language Acquisition*, Basil Blackwell: Oxford.
- Ellis, R. (1991). The interaction hypothesis: A critical evaluation in E. Sadtono (ed.), *Language Acquisition and Second/Foreign Language Classroom*, (179-211), RELC Anthology; Series 28.
- Fitzpatrick, T. Al-Qarni, I., & Meara, P. (2008). Intensive vocabulary learning: A case study. *Language Learning Journal*, 36(2), 239-248.
- Glopper, K. (2002), Lexical Retrieval: An Aspect of Fluent Second–Language Production That Can Be Enhanced. *Language Learning*, 52, 723–754.
- George, D., & Mallery, P. (2003). *SPSS for Windows step by step: A simple guide and reference. 11.0 update* (4th ed.). Boston: Allyn & Bacon.
- Godwin-Jones, R. (2008). Emerging technologies mobile-computing trends: Lighter, faster, smarter. *Language Learning & Technology*, 14(2), 4-11.
- Horst, M., Cobb, T. & Meara, P. (1998). Beyond a Clockwork Orange: acquiring second language vocabulary through reading, *Reading in a Foreign Language*, 11, 207-223.
- Hulstijn, J. H. (2001). ‘Intentional and incidental second-language vocabulary learning: a reappraisal of elaboration, rehearsal and automaticity’, in P. Robinson (ed.), *Cognition and Second Language Instruction*. Cambridge: Cambridge University Press.

Krashen, S. (1989). We acquire vocabulary and spelling by reading: Additional evidence for the Input Hypothesis. *The Modern Language Journal*, 73, 440-464.

Laufer, B. (2005). Focus on form in second language vocabulary learning. *EUROSLA Yearbook*, 5, 223-250.

Laufer, B., & Hulstijn, J. H. (2001). Incidental vocabulary acquisition in a second language: The construct of task-induced involvement. *Applied Linguistics*, 22, 1-26.

Laufer, B. & Shmueli, K. (1997). Memorizing new words: Does teaching have anything to do with it? *RECL Journal*, 28, 89-108.

McNamara, D.S., & Healy, A.F. (1995). A generation advantage for multiplication skill training and nonword vocabulary acquisition. In A.F. Healy & J.L.E. Bourne (Eds.), *Learning and memory of knowledge and skills: Durability and specificity* (pp. 132-169). CA: Sage.

Meara, P., Lightbown, P. & Halter, R. H. (1997). Classrooms as lexical environments, *Language Teaching Research*, 1, 28-47.

Mills, G. E. (2003). *Action research: A guide for the teacher researcher* (2nd ed.). upper Saddle River, NJ: Merrill/Prentice Hall.

Mondria, J-A & Modria-de Vries, S. (1994). Efficiently memorizing words with the help of word cards and 'hand computer': theory and applications, *System*, 22, 47-57.

Nakata, T. (2008). English vocabulary learning with word lists, word cards and computers: Implications from cognitive psychology research for optimal spaced learning. *ReCALL*, 20(1), 3-20.

- Nakata, T. (2011). Computer-assisted second language vocabulary learning in a paired-associate paradigm: a critical investigation of flashcard software. *Computer Assisted Language Learning*, 24(1), 17-38.
- Nation, I. S. P. (2001). *Learning vocabulary in another language*. Cambridge: Cambridge University Press.
- Nation, I. S. P. (1990). *Teaching and Learning Vocabulary*, Massachusetts: Newbury House.
- Nation, I. S. P. & Hwang K. (1995). Where would general service vocabulary stop and special purposes vocabulary begin?, *System*, 23, 35-41.
- Oblinger, D. (2005). Learners, learning & technology. *EDUCAUSE Review*, 40(5), 67-75.
- Parson, R. D., & Brown, K. S. (2002). *Teacher as reflective practitioner and action researcher*. Belmont, CA: Wadsworth/Thomson Learning.
- Pigada, M., & Schmitt, N. (2006). Vocabulary acquisition from extensive reading: A case study. *Reading in a Foreign Language*, 18, 1-28.
- Pimsleur, P. (1967). A memory schedule, *Modern Language Journal*, 51, 73-75.
- Prensk, Marc (2001). *Digital Natives, Digital Immigrants*. NCB University Press, 9(5)
- Pyc, M.A., & Rawson, K.A. (2007). Examining the efficiency of schedules of distributed retrieval practice. *Memory & Cognition*, 35(8), 1917-1927.
- Read, J. (2004). Research in teaching vocabulary. *Annual Review of Applied Linguistics*, 24, 146-161.

- Rott, S. (1999). The effect of exposure frequency on intermediate language learners' incidental vocabulary acquisition through reading. *Studies in Second Language Acquisition*, 21, 589-619.
- Schmitt, N. (2000). *Vocabulary in language teaching*. Cambridge: Cambridge University Press.
- Schmitt, N. (2008). Instructed second language vocabulary learning. *Language Teaching Research*, 12(3), 329-363.
- Schmitt, N. & Schmitt, D. (1995). Vocabulary notebooks: theoretical underpinnings and practical suggestions, *ELT Journal*, 49, 133-143.
- Schmitt, N., Schmitt, D & Clapham, C. (2001). Developing and exploring the behavior of two versions of the Vocabulary Levels Test, *Language Studies*, 18(1), 55-58.
- Schmidt, R. W. (1990). The role of consciousness in second language learning, *Applied Linguistics*, 11, 129-158.
- Schwalbach, E. M. (2003). *Value and validity in action research: A guidebook for reflective practitioners*. Lanham, MD: Scarecrow Press.
- Smith, B. (2004). Computer-mediated negotiated interaction and lexical acquisition. *Studies in Second Language Acquisition*, 26(3): 365-398.
- Swanborn, M. and de Glopper, K. (2002). Incidental word learning while reading: a meta-analysis, *Review of Educational Research*, 69, 261-285.

- Tamaki, K. (2007). Incorporating Nintendo DS into the curriculum leads to marked improvement in English vocabulary: Yawata City Board of Education, Kyoto. *Mainichi Newspaper*, p. 28.
- Tang, E., & Nesi, H. (2003). Teaching vocabulary in two Chinese classrooms: Schoolchildren's exposure to English words in Hong Kong and Guangzhou. *Language Teaching Research*, 7, 65-97.
- Vidal, K. (2003). Academic listening: A source of vocabulary acquisition? *Applied Linguistics*, 24(1), 56-89.
- Waring, R. (2004). A study of receptive and productive learning from word cards. *Studies in Foreign Languages and Literature*, 21(1), 94-114.
- Waring, R., & Takaki, M. (2003). At what rate do learners learn and retain new vocabulary from reading a graded reader? *Reading in a Foreign Language*, 15, 1-27.
- Webb, S.A. (2002). *Investigating the effects of learning tasks on vocabulary knowledge* (Unpublished doctoral dissertation). Victoria University of Wellington, Wellington, New Zealand.
- Webb, S.A. (2009). The effects of pre-learning vocabulary on reading comprehension and writing. *Canadian Modern Language Review*, 65(3), 441-470.
- Webb, S. (2007). The effects of repetition on vocabulary knowledge. *Applied Linguistics*, 28, 46-65.
- West, M. (1953). *A general service list of English words*. London: Longman, Green.

